Remarks

This is a complete response to the pending Office Action mailed 11/4/2005. At the outset, Applicant expresses appreciation for the Examiner's responses to its previous arguments.

In response, these remarks are proper and do not add new matter, but more particularly point out that which is the patentable subject matter in order to clarify Applicant's position that all claims are in condition for allowance.

Applicant has made a correction to the specification herein to correct a typographical mistake.

This is a request for the Examiner to reconsider and withdraw the final rejection of all pending claims. Absent such reconsideration, this case is not in condition for appeal due to unresolved issues making all rejections of independent claims not proper and without basis. Following is an explanation of at least some of the unresolved issues discussed below.

The examination resulting in the anticipatory rejection of claims 1, 13, and 21 is incomplete because it is based on the mischaracterization that Codilian '635 discloses *reading position error signals...for non-consecutive revolutions* as in the present embodiments as claimed. Absent the mischaracterization, the cited reference does not identically disclose all the features of the rejected claim. Thus, the Examiner has not substantiated a prima facie case of anticipation.

Rejection Under Section 102(b)

Claims 1 and 13 were again rejected and claim 21 likewise rejected as being anticipated by Codilian '635. Applicant respectfully reiterates its earlier traversal of this rejection. (see Applicant's response of 8/31/2005, pg. 6)

Claim 1

The Examiner has not substantiated the requisite prima facie case of anticipation because Codilian '635 does not identically disclose all the features of the present embodiments according to claim 1, which include at least the following:

> *reading position error signals of a first head for non-consecutive revolutions to obtain position error signal data....*
> (excerpt of claim 1, emphasis added)

Applicant previously argued that Codilian '635 clearly does not disclose *reading position error signals...for non-consecutive revolutions* as in the present embodiments as claimed. (see Applicant's response of 8/31/2005, pg. 6).

The Examiner maintained the anticipatory rejection by relying on the same passages of Codilian '635 as in the previous rejection. Additionally, the Examiner stated the following basis for the anticipatory rejection:

> Codilian discloses that the first number of disk revolutions can be one, or N=1. Therefore, if a group of tracks or all the tracks on the disk are revolved just one time during the initial PES obtaining process, then when the second PES obtaining process occurs the transducer will the [sic] servo tracks for non-consecutive revolutions to obtain position error signal data.
> (Office Action of 11/4/2005, pg. 5, emphasis added)

Applicant understands the Examiner's argument to be that if the initial RRO estimate in Codilian '635 is based on data collected from only one revolution, then that

one revolution anticipates the *non-consecutive revolutions* of the present embodiments. However, the Examiner's conclusion that Codilian '635 discloses calculating the initial RRO estimate based on data from one revolution is a mischaracterization of the reference.

First, the portion of Codilian '635 on which the Examiner relies expressly discloses that one revolution is not used in calculating the RRO estimate because too much error results from doing so:

> The PES includes the RRO and nonrepeatable errors that normally occur during disk drive operation. As shown in FIG. 6A, the RRO measurements based on one rotation have a relatively large standard deviation σ_1. By averaging the PES over several revolutions, the RRO measurement may be learned with improved approximation error as shown by the standard deviation σ_n shown in FIG. 6B. The learned RRO improves with the number of disk rotations as follows:
>
> $$\sigma_1 = \frac{\sigma_2}{\sqrt{n}} \qquad \text{Equation 1}$$
>
> (Codilian '635 col. 5 lines 28-40, emphasis added)

Equation 1 of Codilian '635 discloses the contemplated manner of reducing the approximation error from an unacceptable level (FIG. 6A) associated with collecting data over one revolution to an acceptable level (FIG. 6B). The skilled artisan readily recognizes that Equation 1 of Codilian '635 is the well-known and widely accepted reduction of statistical error associated with calculating standard deviation of averages instead of individuals. see *Juran's Quality Control Handbook*, 4th Edition, pg. 24.9, "Subgroup Size, n" heading: "the larger the subgroup size, n, the smaller the standard deviation of the distribution of averages..." (copy of citation attached, emphasis added).

Codilian '635 clearly discloses approximating error by the standard deviation of averages, not individuals. Accordingly, in the passage of Codilian '635 above the

meaning of the statement: "number of disk rotations" clearly means "more than one rotation." In fact, the phrase "number of disk rotations" is used at least forty-six times in Codilian '635, and not once is it used in a way that can be reasonably understood to disclose or suggest meaning "one revolution" as the Examiner asserts.

Codilian '635 does contemplate using different numbers of revolutions. For example, some portions of the tracks may have an initial RRO estimate based on only a few revolutions, such as 4 to 8 revolutions, in order to maximize manufacturing throughput. (see, for example Codilian Abstract, col. 6 lines 41-47). However, Codilian '635 is wholly silent regarding basing an RRO estimate on data from only one revolution.

There clearly is no support from Codilian '635 for the Examiner's argument that its RRO estimate is based on data from only one revolution of the disc. The skilled artisan also recognizes that the present embodiments as claimed resolves the shortcomings of Codilian '635 which relies on taking measurements over a subgroup size that is sufficiently large to provide an acceptable statistical error; the increased subgroup size adversely requiring longer data collection. Rather, in the present embodiments the data is obtained from non-consecutive revolutions in order to attenuate the NRRO, thereby phase-shifting it with respect to disc rotation. (see, for example, specification para.[0034])

The Examiner's mischaracterization is not just tenuous, but it is directly contrary to what Codilian '635 actually discloses. The Examiner's basis for this rejection is erroneous because it relies on the mischaracterization of Codilian '635. Absent the mischaracterization, Codilian '635 cannot sustain a Section 102 rejection because it does not identically disclose all the features of the present invention as claimed.

Therefore, Applicant respectfully requests that the Examiner reconsider and withdraw the finality of this anticipatory rejection of claim 1 and the claims depending therefrom. Otherwise, this case is not in condition for appeal because of the unresolved issue that the rejection is clearly not proper and without basis due to the legal deficiency associated with the Examiner's mischaracterization of the cited reference. Basing anticipation on a mischaracterization of the cited reference violates the Examiner's obligation of <u>completeness</u> in considering the patentability of the present invention <u>as claimed</u>. 37 CFR 1.104(a) This case is also not in condition for appeal due to the unresolved issue that, absent the mischaracterization, the rejection is clearly not proper and without basis because the Examiner has failed to cite a reference that identically discloses all the recited features of the rejected claims, thereby failing to substantiate a prima facie case of anticipation.

<u>Claim 13</u>

The Examiner has not substantiated the requisite prima facie case of anticipation because Codilian '635 does not identically disclose all the features of the present embodiments according to claim 13, which include at least the following:

> *control circuitry adapted...<u>reading position error signals</u> of the transducer <u>for non-consecutive revolutions</u> to obtain position error signal data.*
> (excerpt of claim 13, emphasis added)

As above for claim 1, Applicant previously argued that Codilian '635 clearly does not disclose *reading position error signals...for non-consecutive revolutions* as in the present embodiments as claimed. (Applicant's response of 8/31/2005, pg. 6) The Examiner maintained the rejection on the same basis as before, and bolstered it by the

mischaracterization that Codilian '635 discloses determining the RRO estimate based on data from only one revolution of the disc.

Accordingly, as above for claim 1 the Examiner's basis for this rejection is erroneous because it relies on a mischaracterization of Codilian '635. Absent the mischaracterization, Codilian '635 cannot sustain a Section 102 rejection because it does not identically disclose all the features of the present invention as claimed.

Therefore, Applicant respectfully requests that the Examiner reconsider and withdraw the finality of this anticipatory rejection of claim 13 and the claims depending therefrom. Otherwise, this case is not in condition for appeal because of the unresolved issue that the rejection is clearly not proper and without basis due to the legal deficiency associated with the Examiner's mischaracterization of the cited reference. Basing anticipation on a mischaracterization of the cited reference violates the Examiner's obligation of <u>completeness</u> in considering the patentability of the present invention <u>as claimed</u>. 37 CFR 1.104(a) This case is also not in condition for appeal due to the unresolved issue that, absent the mischaracterization, the rejection is clearly not proper and without basis because the Examiner has failed to cite a reference that identically discloses all the recited features of the rejected claims, thereby failing to substantiate a prima facie case of anticipation.

<u>Claim 21</u>

The Examiner has not substantiated the requisite prima facie case of anticipation because Codilian '635 does not identically disclose all the features of the present embodiments according to claim 21, which include at least the following:

> *<u>reading position error signals for non-consecutive revolutions</u> to obtain position error signal data....*
> (excerpt of claim 21, emphasis added)

As above for claim 1, Applicant previously argued that Codilian '635 clearly does not disclose *reading position error signals for non-consecutive revolutions* as in the present embodiments as claimed. (Applicant's response of 8/31/2005, pg. 6) The Examiner maintained the rejection on the same basis as before, and bolstered it by the mischaracterization that Codilian '635 discloses determining the RRO estimate based on data from only one revolution of the disc.

Accordingly, as above for claim 1 the Examiner's basis for this rejection is erroneous because it relies on a mischaracterization of Codilian '635. Absent the mischaracterization, Codilian '635 cannot sustain a Section 102 rejection because it does not identically disclose all the features of the present invention as claimed.

Therefore, Applicant respectfully requests that the Examiner reconsider and withdraw the finality of this anticipatory rejection of claim 21. Otherwise, this case is not in condition for appeal because of the unresolved issue that the rejection is clearly not proper and without basis due to the legal deficiency associated with the Examiner's mischaracterization of the cited reference. Basing anticipation on a mischaracterization of the cited reference violates the Examiner's obligation of <u>completeness</u> in considering the patentability of the present invention <u>as claimed</u>. 37 CFR 1.104(a) This case is also not in condition for appeal due to the unresolved issue that, absent the mischaracterization, the rejection is clearly not proper and without basis because the Examiner has failed to cite a reference that identically discloses all the recited features of the rejected claims, thereby failing to substantiate a prima facie case of anticipation.

Conclusion

This is a complete response to the pending Office Action of 11/04/2005.

Applicant has also filed herewith a Request for Telephone Interview to be held before the Examiner makes the next action on the merits. The interview is necessary, absent allowance, to settle the unresolved issues making this case presently not in condition for appeal.

Should any questions arise concerning this application, the Examiner is encouraged to contact the below signed attorney.

Respectfully submitted,

By: ______________________

Mitchell K. McCarthy, Registration No. 38,794
Randall K. McCarthy, Registration No. 39,297
Fellers, Snider, Blankenship, Bailey & Tippens
100 North Broadway, Suite 1700
Oklahoma City, OK 73102-8810
Telephone: (405) 232-0621
Fax: (405) 232-9659

lustrial Engineering
iality Control

uran's Quality Control
— H·A·N·D·B·O·O·K —

1808 pages • numerous illustrations

ore than ever the International reference work for managers and spe-
lists, the new Fourth Edition of this classic desktop guide defines how to
in, produce, control, and continually improve quality *companywide* for
e 1990s — from the executive suite to the factory floor.

mpetition in quality has demanded severe changes in the approaches to
naging for quality — changes so revolutionary that nearly 90 percent of
e material in this Fourth Edition is either completely new or thoroughly
vised — with contributions from more than two dozen noted interna-
onal authorities. In particular, the book —

Shows step by step how to plan for quality at *every* level — including that
of upper management

Quantifies the impact of high *and* low quality on sales income and
internal costs — and details a structured approach to identifying and
solving chronic quality problems

Explains the state of the art in managing human quality performance,
fostering a responsive corporate culture, and training all personnel in
how to plan, control and improve quality

Describes how quality is managed in six basic industries — process,
electronic components, assembly, complex, job shop, and service — as
well as ongoing approaches to quality in Japan, West Germany, France,
Great Britain, the United States, and other countries

roughout, *Juran's Quality Control Handbook* draws on a global array of
thentic case materials from the vast literature on quality and from un-
iblished company sources. Tough, perceptive, methodical, and un-
llingly realistic, it's packed with the tested concepts and tools which have
ought the leaders in quality to their position of leadership.

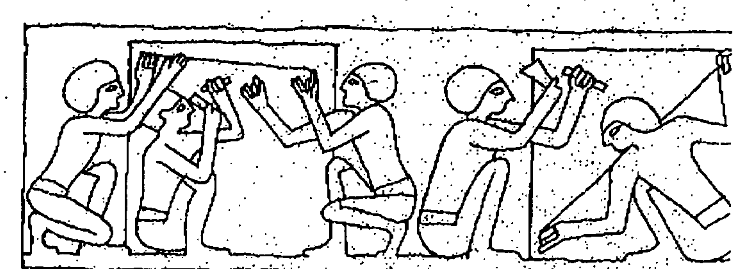
er Design: P.L.K. Graphics, Inc.

90000

For more information about other McGraw-Hill materials, call 1-800-2-MCGRAW in the United States. In other countries, call your nearest McGraw-Hill office.

McGraw-Hill Publishing Company

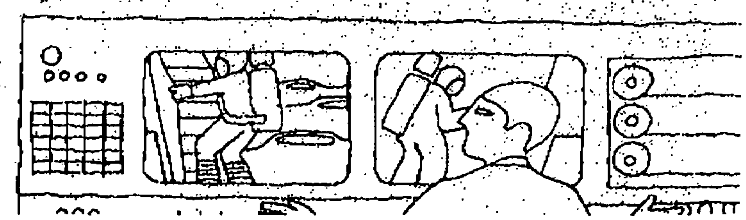
JURAN



Juran's Quality Control HANDBOOK

FOURTH EDITION

J. M. JURAN, Editor in Chief
FRANK M. GRYNA, Associate Editor



Most industrial processes are not in control when first analyzed; many points outside of control limits are common. The reasons for these assignable causes can be discovered and removed (Section 22 under Diagnosis). Mark explanations found for points out of control right on the chart. As remedies are made to the process, new data should be collected, control limits recalculated, and the new data plotted against the revised limits. Control is often attained by degrees. Removing assignable cause and recalculating control limits can be an iterative process. For an example, see Juran and Gryna (1980).

When it is difficult to collect new data, it is common practice to remove the out-of-control subgroups and recalculate the limits from the remaining data. But if new data are not taken, there is no way to be sure all assignable causes have been removed. Control limits and central lines calculated with new data will often be different than those calculated by modifying original data.

Control limits calculated from 10 rather than 25 subgroups are common practice, especially where production runs are short. Unfortunately, their proper location is known with considerably less precision.

Even if no process changes have consciously been made, it is a good idea to recalculate central lines for every 25 subgroups. In practice the old and new central lines are usually compared without any formal test. The procedures in Section 23 under Tests of Hypotheses could also be used.

Monitoring a Process. Control charts can monitor the aim and variability and thereby continually check the *stability* of the process. This check of stability in turn helps to assure that the statistical distribution of the product characteristic is consistent with quality requirements. For parts per million defect levels, tight process control procedures are the key answer to the high sample sizes that would be necessary with acceptance sampling procedures.

Basic Concepts of Control Charts

Estimating the Mean, μ. Shewhart investigated both the subgroup median and the subgroup mean as estimators of μ. He concluded that the mean, $\overline{X}$, was a more sensitive estimator. The mean of a subgroup is the sum of all of the individual points in that subgroup divided by the number of points in that subgroup. $\overline{X} = \Sigma X_i/n$.

Estimating the Standard Deviation σ. Subgroup range R is commonly used to estimate the standard deviation of the distribution of X's, σ_x. For subgroup size n of 2, R is as efficient an estimator of σ_x as the standard deviation of the subgroups s. Both statistics use all of the available data. For $n = 3$, s becomes a more efficient statistic. s uses all three of the data points in each subgroup. R uses only the two end points and thus ignores the information contained in the center point. For hand calculation and small n's, the ease of use and reduced possibility of error make R a better choice than s. Tippot (1950) recommends R for $n \leq 20$. ANSI/ASQC (1985) recommends R for manual calculation and $n \leq 10$.

$$\sigma_X \simeq \overline{R}/d_2 \simeq \bar{s}/c_2 \qquad s_X = \sqrt{\Sigma(X - \overline{X})^2/(n-1)}$$

$$R = X_{\text{LARGEST}} - X_{\text{SMALLEST}} \qquad \overline{R} = \frac{\Sigma R}{N}$$

d_2 and c_2 are functions of subgroup size and may be found in Table A, Appendix II. Both R and s are valid estimators of σ_X only if the subgroups are taken at random from a stable population (Tippett, 1950, pp. 9–10). Since it is common practice to take subgroups periodically rather than at random, there is a risk that the frequency of sampling will align with the action of some unknown variable and produce a range or standard deviation out of proportion to σ_X.

Control Limits. Control limits based on the statistical variation of the process can be established at the mean ± 3 standard deviations of the parameter. If the parameter being charted is distributed normally, about 99.73 percent of all values will fall within the control limits. Therefore, if a point falls outside the control limits, there are only 27 chances in 10,000 that the distribution has not changed. A red X probably caused the distribution to shift, grow wider, or both. The chance of a false out-of-control signal for control limits set at other multiples of σ_X can be found in a table of areas under the normal curve (Table B, Appendix II). The distribution of $\overline{X}$ will always be very close to normal for $n \geq 4$. The distribution of X may or may not be normal. See the specific chart types below for the formulas and factors used to calculate control limits.

The control limits for R will be too wide if the distribution of X's is skewed or leptokurtic (more pointed top and longer, thinner tails than normal); too narrow if the distribution of X's is platykurtic (flatter top than normal). If the value of $\overline{X}$ changes within the subgroups while the subgroups for setting control limits are being taken, the control limits for R will be too wide. Trending factors such as tool wear or temperature increase are a common cause of this malady. Subgroups taken too far apart will make this situation worse. Too small a number of subgroups can give an inaccurate $\overline{R}$ and thus incorrect control limits for both $\overline{X}$ and R. If the control limits for $\overline{X}$ and R are too wide, the risk of missing a signal for action (β risk) increases. If the control limits for R are too narrow, the risk of getting a false out-of-control signal (α risk) increases.

Control limits can also be calculated to include a preassigned percentage (e.g., 99.0 percent) of the charted values when the process is in statistical control. For formulas and factors, see ANSI/ASQC (1985).

A note of caution: A state of "statistical control" merely means that only random causes are present. It does not necessarily mean that the product meets specifications. Conversely, a process which is not in statistical control may still be producing product which conforms to specification. Action on such a process should have a much lower priority than action on processes which are producing nonconforming product.

Subgroup Size, n. Since $\sigma_{\overline{X}} = \sigma_X/\sqrt{n}$, the larger the subgroup size, n, the smaller the standard deviation of the distribution of averages, $\sigma_{\overline{X}}$, the tighter the 3σ control limits, and the more sensitive the chart for $\overline{X}$. However, as n gets larger, the time required to obtain and plot the data gets longer. Transient red X's can do substantial damage before they are discovered. The sensitivity of a chart for detecting process changes with different subgroup sizes can be defined by an operating characteristic curve. An example is given below. Subgroups are normally of equal size. Grant and Leavenworth (1980) give procedures for unequal subgroups. Four and five are common subgroup sizes for variable data. * Note

See Control Charts for Fraction Nonconforming, below, for a discussion of subgroup size when charting attribute data.

Rational Subgrouping. Each subgroup must come from a single distinct population. A subgroup of consecutively produced individuals taken from the same cavity of a multiple-cavity mold is appropriate.